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(54) Abstract Title
Video coding and decoding methods

(57) Video coding and decoding methods. The video coding method includes: receiving channel status information indicating an error profile of the communication channel; and adaptively adding redundancy information into data packets divided by syntax with a layer configuration, based on the channel status information. The video decoding method includes: receiving an encoded video bitstream; identifying whether an additional layer is present and which layer has been added; and decoding corresponding layers based on the information about the additional layer. The video coding and decoding methods can be implemented in a video coder-decoder (CODEC) to avoid erroneous decoding in an error-prone channel, thus improving error-resilience of the CODEC.

FIG. 1

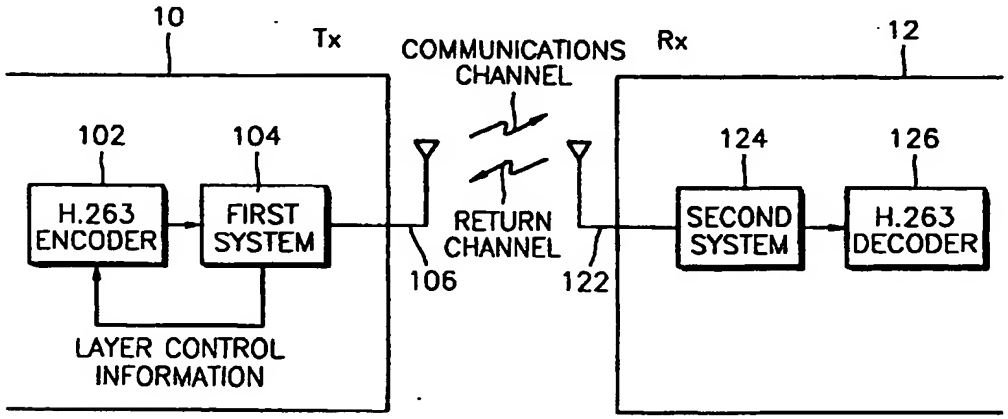

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FIG. 1

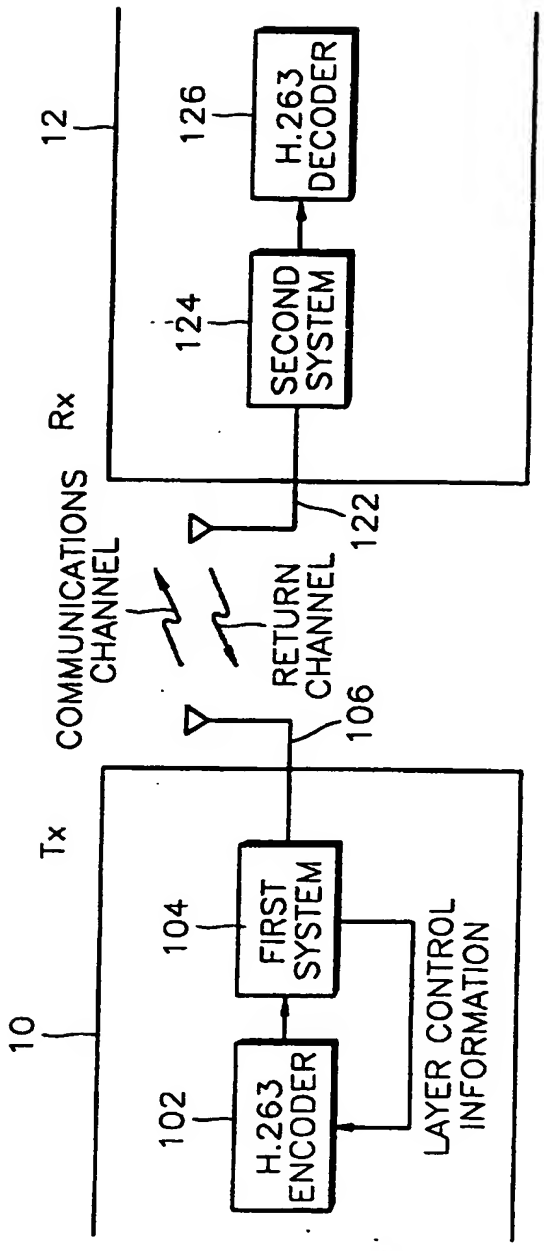
10
Tx
102
H.263 ENCODER
104
FIRST SYSTEM
LAYER CONTROL INFORMATION
106
COMMUNICATIONS CHANNEL
RETURN CHANNEL
122
12
Rx
124
SECOND SYSTEM
126
H.263 DECODER

FIG. 2

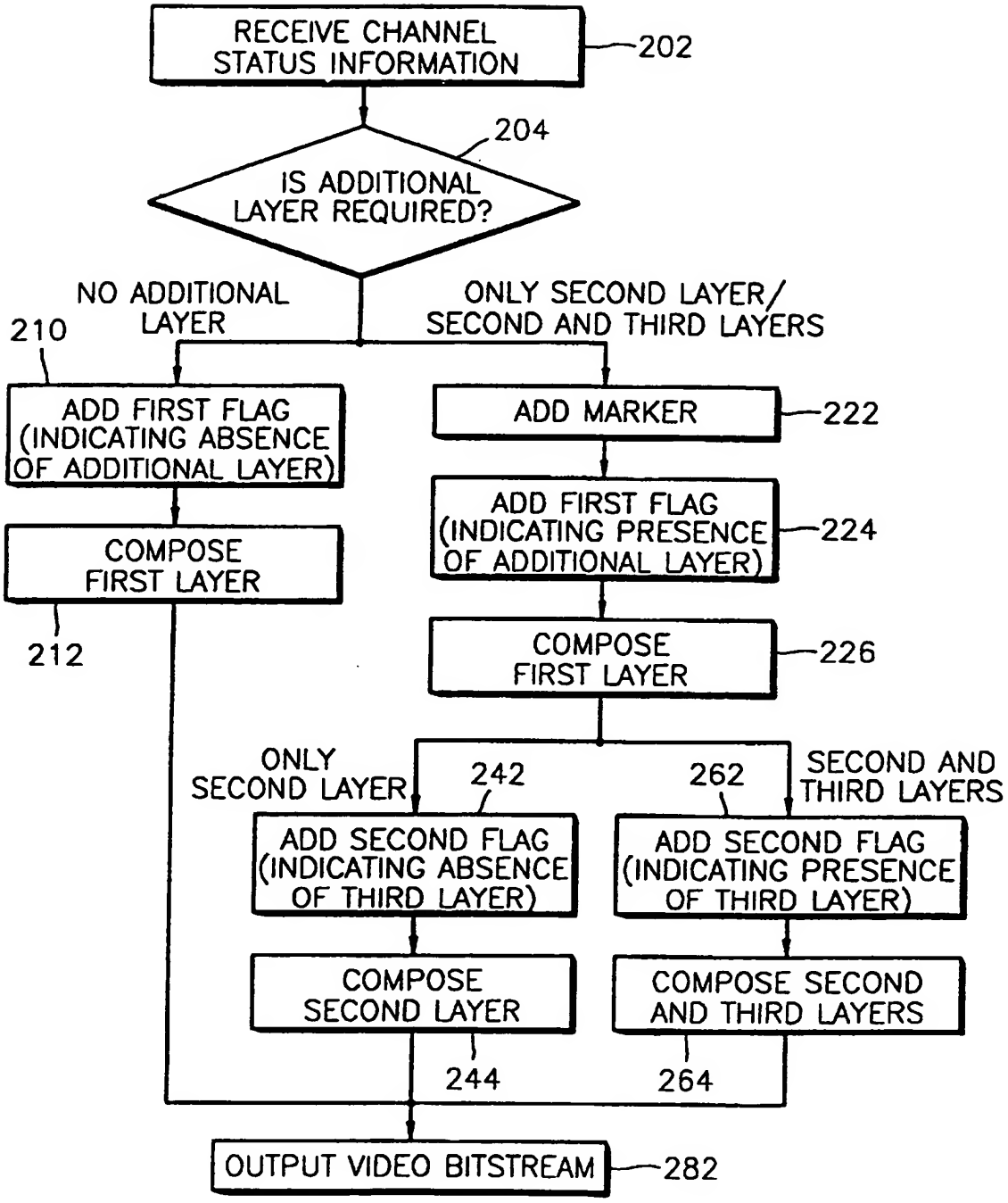
RECEIVE CHANNEL STATUS INFORMATION
202
204
IS ADDITIONAL LAYER REQUIRED?
NO ADDITIONAL LAYER
ONLY SECOND LAYER/ SECOND AND THIRD LAYERS
210
ADD FIRST FLAG (INDICATING ABSENCE OF ADDITIONAL LAYER)
COMPOSE FIRST LAYER
212
ADD MARKER
222
ADD FIRST FLAG (INDICATING PRESENCE OF ADDITIONAL LAYER)
224
COMPOSE FIRST LAYER
226
ONLY SECOND LAYER
242
262
SECOND AND THIRD LAYERS
ADD SECOND FLAG (INDICATING ABSENCE OF THIRD LAYER)
ADD SECOND FLAG (INDICATING PRESENCE OF THIRD LAYER)
COMPOSE SECOND LAYER
COMPOSE SECOND AND THIRD LAYERS
244
264
OUTPUT VIDEO BITSTREAM
282

FIG. 3

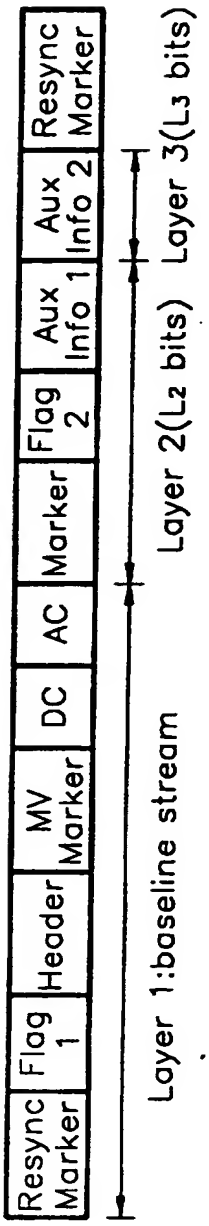

FIG. 4

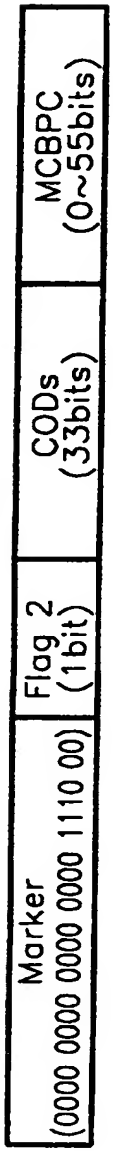

FIG. 5

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VIDEO CODING AND DECODING METHODS

The present invention relates to video coding and decoding methods, and more particularly, to video coding and decoding methods which utilize a data partitioning structure, and video coding and decoding apparatuses which use these methods.

Recently, the video coding group, so called Question 15 under Study Group 16, in the International Telecommunication Unit (ITU), which has defined many standards associated with video conferencing such as H.32X, has been working on development of an advanced video coding scheme named H.263++. A large amount of effort has been spent in making H.263++ resilient against an error-prone mobile channel. Thus far, many technical contributions for error resilience have been proposed to Q.15/SG16 in ITU-T. Among the technical proposals, data partitioning and reversible variable length coding (RVLC), jointly proposed by UCLA/Samsung, have had a great impact on forming the error resilience features in H.263++. Although the error resilience features have not yet been adopted in the H.263++ scheme, most of the recent technical contributions in the error resilience session of Q.15/SG16 in ITU-T have been based on the use of data partitioning and RVLC. The present invention is directed to the data partitioning.

It is an aim of the present invention is to provide a method and apparatus for coding video data by adaptively adding redundancy bits into a video bitstream in accordance with a channel status and the degree of importance of syntax.

Another aim of the present invention is to provide a method and apparatus for decoding the video bitstream encoded by the video coding method.

According to an aspect of the present invention, there is provided a video coding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising: receiving channel status information indicating an error profile of the communication channel; and adaptively adding redundancy information into data packets divided by syntax with a layer configuration, based on the channel status information.

In another embodiment of the present invention, there is provided a video coding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising: (a) receiving channel status information containing information that is indicative of an error profile of the channel; (b) determining whether an additional layer is required, based on the channel status information; (c) if, in the step (b), it is determined that the additional layer is not required, composing a first layer containing video data information and administrative information; (d) if, in the step (b), it is determined that only a second layer is required, configuring a second layer by adding a

first auxiliary information containing redundancy information corresponding to the information on the first layer; (e) if, in the step (b), it is determined that both the second and third layers are required, composing a third layer by adding first auxiliary information containing redundancy information corresponding to the information on the first layer, and a third layer by adding a second auxiliary information containing other redundancy information corresponding to the information on the first layer.

Preferably, if, in the step (b), it is determined that either only the second layer, or both the second and third layers are required, the video coding method further comprises adding a predetermined unique marker to the preceding part of the corresponding packet in the configuration of the second layer. Also, if, in the step (b), it is determined that either only the second layer, or both the second and third layers are required, the video coding method may further comprise adding a second flag bit indicating the presence of an additional layer.

Preferably, the first auxiliary information contains information on coding parameters of the picture data in the first layer, and one or more COD bits indicating whether the coding is performed. Also, the COD bit may consist of three bits per macro block. Also, the first auxiliary information may contain one or more MCBPC (MaCro Block Pattern Chrominance) bit per macro block, which indicate kinds of chrominance of macro blocks, and the MCBPC bit may consist of 5 bits per macro block to be coded.

Preferably, the second auxiliary information contains information on coding parameters of the picture data in the first layer. For example, the second auxiliary information may contain bits indicating the number of MCBPC (MaCro Block Pattern Chrominance) bits per macro block, the MCBPC indicating kinds of chrominance of macro blocks. The bit indicating the number of MCBPC bits may consist of 4 bits per QCIF (Quarter Common Intermediate Format). Also, the second auxiliary information may contain one or more COD bit indicating whether the coding is performed, and the COD bit may consist of 1 bit per macro block. Preferably, the second auxiliary information contains MB (macro block) Type bits indicating types of macro block, and the MB Type bits consist of 2 bits per macro block.

According to another aspect of the present invention, there is provided a video decoding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising: inputting a video bitstream to which redundancy information has been adaptively added with a layered configuration, to data packets divided by syntax; identifying whether an additional layer is present and which layer has been added; and decoding corresponding layers based on the information about the additional layer.

In another embodiment of the present invention, there is provided a video decoding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, comprises: inputting a video bitstream to which redundancy information has been

adaptively added with a layered configuration, to data packets divided by syntax; defining a first layer by detecting a resynchronization marker from the video bitstream, and identifying a first flag bit indicating the presence or absence of an additional layer in the first layer; if the first flag bit indicates the absence of the additional layer, decoding the first layer; if the first flag bit indicates the presence of the additional layer, identifying a marker indicating the start of a second layer; identifying a second flag bit indicating the presence or absence of a third layer; if the second flag bit indicates the absence of the third layer, decoding the first and second layers; and if the second flag bit indicates the presence of the third layer, decoding the first, second and third layers.

The invention may be embodied in a general purpose digital computer by running a program from a computer usable medium, including but not limited to storage media such as magnetic storage media (e.g., ROM's, floppy disks, hard disks, etc.), optically readable media (e.g., CD-ROMs, DVDs, etc.) and carrier waves (e.g., transmissions over the Internet). Hence, the present invention may be embodied as a computer usable medium.

For a better understanding of the invention, and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings in which:

Figure 1 is a block diagram of a video data transceiver system which is used to implement video coding and decoding methods according to the present invention;

Figure 2 is a flowchart illustrating the major steps of a video coding method according to an embodiment of the present invention;

Figure 3 shows an example of a bitstream encoded by the video coding method according to the present invention;

Figure 4 shows an example of the Layer 2 shown in Figure 3; and

Figure 5 shows an example of the Layer 3 shown in Figure 3.

Referring now to Figure 1, a video data transceiver system, which is used to implement video coding and decoding methods according to a preferred embodiment of the present invention, includes a transmitter 10 and a receiver 12. The transmitter 10 includes a H.263 encoder 102 and a first system 104, and the receiver 12 includes a H.263 decoder 126 and a second system 124.

In the operation of the video data transceiver system, the H.263 encoder 102 of the transmitter 10 encodes video data, and the first system 104 receives and multiplexes the encoded video data and adds control information to transmit a video bitstream through a radio frequency (RF) stage on a wireless communications channel. When the receiver 12 receives the video bitstream through the wireless communications channel, the second system 124 demultiplexes the received bitstream and extracts the control information. The demultiplexed encoded video bitstream is decoded by the H.263 decoder 126. Also,

during the decoding process by the H.263 decoder 126, channel status information containing error information of the transmitted video bitstream may be extracted. Then, the receiver 12 transmits the channel status information through an extra return channel.

The first system 104 of the transmitter 10 receives through the return channel the channel status information that contains status information about the encoded video bitstream, and transmits layer control information to the H.263 encoder 102 based on the received information, to allow the H.263 encoder 102 to define a redundancy adding configuration. The H.263 encoder 102 adaptively adds redundancy information into the video data stream based on the received layer control information. That is, since the addition of redundancy information is controlled in accordance with the channel status, error resilience against an error-prone wireless channel is improved.

Figure 2 is a flowchart illustrating the major steps of the video encoding method according to an embodiment of the present invention. Referring to Figure 2, the video encoding method includes receiving channel status information that contains information indicating error profile of a channel (step 202) and determining whether an additional layer is required, based on the channel status information (step 204). In this embodiment, a first layer with respect to a baseline stream, and additional layers including second and third layers, can be defined.

Then, if the step 204 determines that an additional layer is not required, a first flag bit is added into the data packet to indicate that the absence of the additional

layer (step 210), and the first layer that contains the second and third layers is configured (step 212). Conversely, if the step 204 determines that only the second layer is required or both the second and third layer are required, the first flag bit is added to indicate the presence of the additional layer (step 204) and then the first layer is configured (step 226). Then, in the case where only the second layer is needed, a second layer is composed by adding first auxiliary information containing redundancy information corresponding to the information of the first layer (step 244). Meanwhile, in the case where both the second and third layers are needed, the second layer is composed by adding the first auxiliary information containing redundancy information corresponding to the information of the first layer, and the third layer is also composed by adding second auxiliary information containing other redundancy information corresponding to the information of the first layer (step 264). Also, in the case where the step 204 determines that additional layers, only the second layer or both the second and third layers, are required, preferably, prior to the step 224, a predetermined unique marker is added into the preceding part of the corresponding packet of the additional layer (step 222). Also, prior to the steps 244 and 264, a second flag bit may be added into the corresponding packet to indicate the absence (step 242) or presence (step 262) of the third layer.

Through the above steps, redundancy information is adaptively added into the data packet divided by syntax with the layered configuration according to the channel

status information, and thus a video bitstream results (step 282).

As more layers are included in a packet, error resilience is progressively improved, but the coding efficiency is sacrificed. Selection of modes (first layer only, first and second layers, or first, second and third layers) can be fully configured in a system by monitoring channel status, and one having skill in the art can properly select a mode.

In the present embodiment, for simplicity, experiments were conducted with QCIF (Quarter Common Intermediate Format) sequences and 11 macro blocks (MBs) in each packet. Figure 3 shows a configuration of the bitstream encoded by the video coding method according to the present invention. The bitstream of Figure 3 includes a first layer (Layer 1) only, both the first and second layers (Layer 1+2), or the first, second and third layers (Layer 1+2+3). The Layer 1 includes a first flag bit (Flag 1) indicating whether an additional layer is present or not, and header bits (Header) containing video data information such as DC, AC and MV bits, which are apparent to one skilled in the art relating to MPEG technology, and information about coding parameters. The Layer 2 includes a predetermined unique marker (Marker) at the preceding part thereof, a second flag bit (Flag 2) that is indicative of the presence of the additional layer, and first auxiliary information (Aux Info 1) containing redundancy information corresponding to the information of the first layer. The Layer 3 includes second auxiliary information (Aux Info 2) containing information about

coding parameters with respect to the picture data of the first layer.

Figure 4 shows an example of the Layer 2 shown in Figure 3. Because the Layer 2 is composed only when it is determined that an additional layer is needed, as mentioned with reference to Figure 2, a predetermined unique Marker , for example, a 22-bit unique code (0000 0000 0000 0000 1110 00), is added into the preceding part of the packet of the Layer 2. The packet of the Layer 2 includes a 1-bit Flag 2, 3 bits of COD per MB, which are indicative of coding status, and 5 bits of MCBPC (MaCro Block Pattern Chrominance) per MB, which indicate kinds of chrominance of MBs. Since the number of macro blocks is 11, 33 bits of COD are included in the packet of the Layer 2. Also, since the presence or absence of MCBPC depends on whether coding is performed or not, the number of bits thereof ranges between 0 and 55.

Figure 5 shows an example of the Layer 3 shown in Figure 3. Referring to Figure 5, the Layer 3 contains bits as a second auxiliary information, which represent the number of MCBPC bits that are indicative of kinds of chrominance of MBs. Preferably, the bits representing the number of MCBPC bits consist of four bits per QCIF. Also, the Layer 3 contains 1 bit of COD per MB, that is, 11 bits of COD. Also, the Layer 3 contains MB Type bits representing types of MB. Here, preferably, the MB Type bit consists of two bits per MB. Also, since the presence or absence of the MB Type bit depends on whether or not the coding is performed, the number of MB Type bits ranges between 0 and 22.

Computer simulation was performed to evaluate the video coding and decoding methods according to the embodiment of the present invention, based on the common simulation conditions which have been established for evaluation of technical contributions in terms of error profiles, coding parameters such as bit rate and frame rate, minimum number of frames to be encoded, and more by the ITU-T Q.15/SG16 in July 1998. In accordance with the common conditions, 950 frames of four test sequences aiming at 48 kbps/10 fps were encoded. A quantizing coefficient of a quantizer for the INTRA frames were set to 15, and the number of frames skipped was set to 2 for 10 fps. Among a variety of recommended error profiles, three wideband CDMA error profiles were chosen for use, whose characteristics are shown in Table 1.

TABLE 1

Error Profile	Doppler Frequency [Hz]	Average BER	Average Burst Length [bits]
Error 1	70	1.26×10E-3	17
Error 2	5.3	8.17×10E-5	11
Error 3	211	9.37×10E-5	11

Tables 2 through 5 show measured average PSNR (peak signal-to-noise ratio) in dB for the first 500 decoded frames. Frame loss for each case is almost constant for each error profile.

In particular, Table 2 shows the average PSNR in terms of channel error with respect to a first sample sequence (referred to as "Mother and daughter sequences" at 32

kbps/10 fps. Table 3 shows average PSNR in terms of channel error with respect to a second sample sequence (referred to as "Container sequences") at 32 kbps/10 fps. Table 4 shows average PSNR in terms of channel error with respect to a third sample sequence (referred to as "Forman sequences") at 48 kbps/10 fps. Table 5 shows average PSNR by channel error with respect to a fourth sample sequence (referred to as "News sequences").

TABLE 2

Layer (bit rate)	Error 1	Error 2	Error 3
H.263++ (32 kbps)	27.34	29.63	29.10
Data Partitioning (DP)	29.10	30.02	29.98
DP + Layer 2	30.26	30.89	30.03
DP + Layer 2/3	30.87	31.02	30.29

TABLE 3

Layer (bit rate)	Error 1	Error 2	Error 3
H.263++ (32 kbps)	28.38	29.96	29.68
Data Partitioning (DP)	29.79	30.01	29.98
DP + Layer 2	30.02	30.30	30.10
DP + Layer 2/3	30.08	30.57	30.37

TABLE 4

Layer (bit rate)	Error 1	Error 2	Error 3
H.263++ (48 kbps)	24.78	28.10	27.69
Data Partitioning (DP)	28.89	29.77	29.42
DP + Layer 2	29.56	30.02	29.42
DP + Layer 2/3	29.87	30.10	29.97

TABLE 5

Layer (bit rate)	Error 1	Error 2	Error 3
H.263++ (48 kbps)	25.35	30.47	30.01
Data Partitioning (DP)	28.65	30.94	30.30
DP + Layer 2	29.84	31.10	30.93
DP + Layer 2/3	30.04	31.77	31.22

As shown in Tables 2 through 5, the average PSNR sequentially increases in the case of using the simple H.263+ encoding, the case of encoding based on data partitioning (DP), the case of adding the Layer 2 based on the DP, and the case of adding the Layers 2 and 3. In particular, referring to Table 2 where the first sample sequence (32 kbps/10 fps) is used, for Error 1, the average PSNR was 27.34 dB in the case of applying the conventional H.263+ encoding, 29.10 dB in the case of encoding based on the DP, 30.26 dB in the case of adding Layer 2 based on the DP, and 30.87 dB in the case of adding Layers 2 and 3 based on the DP.

According to the results of a demonstration for picture quality comparison with respect to the error profiles using D1 tape, the use of simple H.263++ can produce best picture quality under error-free channel conditions. However, error resilience affects the picture quality more in an error-prone channel. The encoding and decoding methods according to the present invention can sharply decrease the occurrence of fatally erroneous pictures due to an error-prone channel, thereby improving the overall picture quality.

Also, in general, the compression ratio and coding efficiency are inversely proportional to error robustness. Given a channel having certain bit budget, it is required to add redundancy information into a source-encoded bitstream, which sacrifices coding efficiency in a decreased compression ratio, so as to make the encoded bitstream more error-resilient. In addition to the above mentioned features, there is an advantage of redundancy in fixed length while doing rate control. The variation of the number of bits for redundancy information can lead to a very good approximation of desirable rate control.

As described above, the video encoding and decoding methods according to the present invention can be implemented in a video coder-decoder (CODEC) to avoid erroneous decoding in an error-prone channel, so that the PSNR is improved, thus enhancing the overall picture quality.

Also, the video coding and decoding methods according to the present invention can be implemented by video

coding and decoding apparatuses, respectively. Preferably, the video coding apparatus (not shown) includes a channel information receiving unit, an additional layer determining unit and an encoding unit. The channel information receiving portion receives channel status information representing an error profile of the channel. The additional layer determining unit determines whether or not an additional layer is needed. The encoding unit generates a first layer data field containing picture data information and management information. Also, the encoding portion adds first auxiliary information as a second layer data field, which contains redundancy information corresponding to the information of the first layer, into the first layer data field. Also, if the additional layer determining unit determines that either only the second layer, or both the second and third layers are required, the encoding unit adds second auxiliary information, which contains other redundancy information corresponding to the information of the first layer, into the signal containing the first auxiliary information.

Preferably, the video decoding apparatus (not shown) includes a bitstream inputting unit, an identifying unit and a decoding unit. The bitstream inputting unit inputs a video bitstream to which redundancy information has been adaptively added with a layered configuration, into a data packet divided by syntax. The identifying portion detects a resynchronization marker (Resync Marker) from the video bitstream to define the first layer, and identifies a first flag bit that is indicative of the presence of an additional layer in the first layer. If the first flag bit represents the presence of an additional layer, the

identifying unit identifies a marker indicating the start of the second layer. Also, the identifying unit identifies a second flag bit indicating the presence of a third layer.

The decoding unit decodes the first layer if the first flag bit represents that the additional layer is absent, and decodes the first and second layers if the second flag bit represents that the third layer is absent. Also, the decoding unit decodes the first, second and third layers if the second flag bit represents that the third layer is present.

The video coding and decoding methods described herein may be embodied in a general purpose digital computer by running a program from a computer usable medium, including but not limited to storage media such as magnetic storage media (e.g., ROM's, floppy disks, hard disks, etc.), optically readable media (e.g., CD-ROMs, DVDs, etc.) and carrier waves (e.g., transmissions over the Internet). A functional program, code and code segments, used to implement the present invention can be derived by a skilled computer programmer from the description of the invention contained herein.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extend to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

Claims

1. A video coding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising:

receiving channel status information indicating an error profile of the communication channel; and

adaptively adding redundancy information into data packets divided by syntax with a layer configuration, based on the channel status information.

2. A video coding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising:

(a) receiving channel status information containing information that is indicative of an error profile of the channel;

(b) determining whether an additional layer is required, based on the channel status information;

(c) if, in the step (b), it is determined that the additional layer is not required, composing a first layer containing video data information and administrative information;

(d) if, in the step (b), it is determined that only a second layer is required, configuring a second layer by adding a first auxiliary information containing redundancy

information corresponding to the information on the first layer;

(e) if, in the step (b), it is determined that both the second and third layers are required, composing a third layer by adding first auxiliary information containing redundancy information corresponding to the information on the first layer, and a third layer by adding a second auxiliary information containing other redundancy information corresponding to the information on the first layer.

3. The video coding method of claim 2, further comprising adding a predetermined unique marker to the preceding part of the corresponding packet in the configuration of the second layer if, in the step (b), it is determined that either only the second layer, or both the second and third layers are required.

4. The video coding method of claim 2 or 3, further comprising adding a second flag bit indicating the presence of an additional layer if, in the step (b), it is determined that either only the second layer, or both the second and third layers are required.

5. The video coding method of any of claims 2, 3 or 4, wherein the first auxiliary information contains information on coding parameters of the picture data in the first layer.

6. The video coding method of any of claims 2 to 5, wherein the first auxiliary information contains one or more COD bits indicating whether the coding is performed.

7. The video coding method of claim 6, wherein the COD bit consists of three bits per macro block.

8. The video coding method of any of claims 2 to 7, wherein the first auxiliary information contains one or more MCBPC (MaCro Block Pattern Chrominance) bit per macro block, which indicate kinds of chrominance of macro blocks.

9. The video coding method of claim 8, wherein the MCBPC bit consists of 5 bits per macro block to be coded.

10. The video coding method of any of claims 2 to 9, wherein the second auxiliary information contains information on coding parameters of the picture data in the first layer.

11. The video coding method of any of claims 2 to 10, wherein the second auxiliary information contains bits indicating the number of MCBPC (MaCro Block Pattern Chrominance) bits per macro block, the MCBPC indicating kinds of chrominance of macro blocks.

12. The video coding method of claim 11, wherein the bit indicating the number of MCBPC bits consists of 4 bits per QCIF (Quarter Common Intermediate Format).

13. The video coding method of claim 12, wherein the second auxiliary information contains one or more COD bit indicating whether the coding is performed.

14. The video coding method of claim 13, wherein the COD bit consists of 1 bit per macro block.

15. The video coding method of any of claims 2 to 14, wherein the second auxiliary information contains MB (macro block) Type bits indicating types of macro block.

16. The video coding method of claim 15, wherein the MB Type bits consist of 2 bits per macro block.

17. A computer readable medium having embodied thereon a computer program for video coding,

wherein the video coding comprises the steps of:

(a) receiving channel status information containing information that is indicative of an error profile of the channel;

(b) determining whether an additional layer is required, based on the channel status information;

(c) composing a first layer containing picture data information and management information if, in the step (b), it is determined that the additional layer is not required;

(d) if, in the step (b), it is determined that only a second layer is required, composing a second layer by adding first auxiliary information containing redundancy information corresponding to the information of the first layer;

(e) if, in the step (b), it is determined that both the second and third layers are required, composing a second layer by adding first auxiliary information containing redundancy information corresponding to the information of the first layer, and a third layer by adding second auxiliary information containing other redundancy information corresponding to the information of the first layer.

18. The computer readable medium of claim 17, wherein the video coding further comprises adding a predetermined unique marker to the preceding part of the corresponding packet in the configuration of the second layer if it is determined in the step (b) that either only the second layer, or both the second and third layers are required.

19. The computer readable medium of claim 17 or 18, wherein the video coding further comprises adding a second flag bit indicating the presence of an additional layer if it is determined in the step (b) that either only the second layer, or both the second and third layers are required.

20. The video coding method of claim 17, 18 or 19, wherein the first auxiliary information contains information on coding parameters of the picture data in the first layer.

21. The video coding method of any of claims 17 to 20, wherein the first auxiliary information contains one or more COD bits indicating whether the coding is performed.

22. The video coding method of claim 21, wherein the COD bit consists of three bits per macro block.

23. The video coding method of any of claims 17 to 22, wherein the first auxiliary information contains one or more MCBPC (MaCro Block Pattern Chrominance) bit per macro block, which indicate kinds of chrominance of macro blocks.

24. A video coding apparatus for encoding video data to be transmitted through a communication channel, the video coding apparatus comprising:

means for receiving channel status information containing information that is indicative of an error profile of the channel;

means for determining whether an additional layer is required, based on the channel status information; and

encoding means for generating a first layer data field containing picture data information and administrative information, if the means for determining whether the additional layer is required determines that only a second layer is required, adding first auxiliary information as a second layer data field, which contains redundancy information corresponding to the information of the first layer data field, and if the means for determining whether the additional layer is required determines that both the second and third layers are required, adding first auxiliary information as a second layer data field, which contains redundancy information corresponding to the information of the first layer data field, and second auxiliary information as a third layer data field, which

contains other redundancy information corresponding to the information of the first layer data field.

25. The video coding apparatus of claim 24, wherein a encoding means adds a predetermined unique marker into the preceding part of the corresponding layer if it is determined that either only the second layer or both the second and third layers are required.

26. The video coding apparatus of claim 24 or 25, wherein encoding means adds a second flag bit indicating the presence of an additional layer if it is determined that either only the second layer or both the second and third layers are required.

27. The video coding method of claim 24, 25 or 26 wherein the first auxiliary information contains information on coding parameters of the picture data in the first layer.

28. The video coding method of claim 27, wherein the first auxiliary information contains one or more COD bits indicating whether the coding is performed.

29. The video coding method of claim 28, wherein the COD bit consists of three bits per macro block.

30. The video coding method of claim 28 or 29, wherein the first auxiliary information contains one or more MCBPC (MaCro Block Pattern Chrominance) bit per macro block, which indicate kinds of chrominance of macro blocks.

31. A video decoding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising:

inputting a video bitstream to which redundancy information has been adaptively added with a layered configuration, to data packets divided by syntax;

identifying whether an additional layer is present and which layer has been added; and

decoding corresponding layers based on the information about the additional layer.

32. A video decoding method for use in a video data transceiver for transmitting and receiving video data through a communications channel, the method comprising:

inputting a video bitstream to which redundancy information has been adaptively added with a layered configuration, to data packets divided by syntax;

defining a first layer by detecting a resynchronization marker from the video bitstream, and identifying a first flag bit indicating the presence or absence of an additional layer in the first layer;

if the first flag bit indicates the absence of the additional layer, decoding the first layer;

if the first flag bit indicates the presence of the additional layer, identifying a marker indicating the start of a second layer;

identifying a second flag bit indicating the presence or absence of a third layer;

if the second flag bit indicates the absence of the third layer, decoding the first and second layers; and

if the second flag bit indicates the presence of the third layer, decoding the first, second and third layers.

33. A computer readable medium having embodied thereon a computer program for video decoding, wherein the video decoding comprises the steps of:

(a) inputting a video bitstream to which redundancy information has been adaptively added with a layered configuration, to data packets divided by syntax;

(b) defining a first layer by detecting a resynchronization marker from the video bitstream, and identifying a first flag bit indicating the presence or absence of an additional layer in the first layer;

(c) if the first flag bit indicates the absence of an additional layer, decoding the first layer;

(d) if the first flag bit indicates the presence of an additional layer, identifying a marker indicating the start of a second layer;

(e) identifying a second flag bit indicating the presence or absence of a third layer;

(f) if the second flag bit indicates the absence of the third layer, decoding the first and second layers; and

(g) if the second flag bit indicates the presence of the third layer, decoding the first, second and third layers.

34. A video decoding apparatus for decoding encoded video data, comprising:

means for inputting a video bitstream to which redundancy information has been adaptively added with a layered configuration, to data packets divided by syntax;

identifying means for defining a first layer by detecting a resynchronization marker from the video bitstream, identifying a first flag bit indicating the presence or absence of an additional layer in the first layer, identifying a marker indicating the start of a second layer if the first flag bit indicates the presence of an additional layer, and identifying a second flag bit indicating the presence or absence of a third layer;

means for decoding the first layer if the first flag bit indicates the absence of an additional layer, decoding the first and second layer if the second flag bit indicates the absence of the third layer, and decoding the first, second and third layers if the second flag bit indicates the presence of the third layer.

35. A video coding method substantially as hereinbefore described with reference to Figure 2 of the accompanying drawings.

36. A computer readable medium having embodied thereon a computer program for video coding, substantially as hereinbefore described with reference to the accompanying drawings.

37. A video coding apparatus substantially as hereinbefore described with reference to the accompanying drawings.

38. A video decoding method substantially as hereinbefore described.

39. A computer readable medium having embodied thereon a computer program for video decoding, substantially as hereinbefore described.

40. A video decoding apparatus substantially as hereinbefore described.

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.R): H4P (PEP, PEM, PPEC & PPS)

Int Cl (Ed.7): H04L (1/12, 1/16 & 29/08)
H03M (13/35)
H04N (7/66)

Other: ONLINE : EPODOC, WPI, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2306867 A	BOSCH (see the third complete paragraph on page 2 and the paragraph bridging pages 5 and 6)	None
A	WO 97/16046 A1	GENERAL INSTRUMENT (page 10 lines 2-12 and page 17 lines 16-25)	None

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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